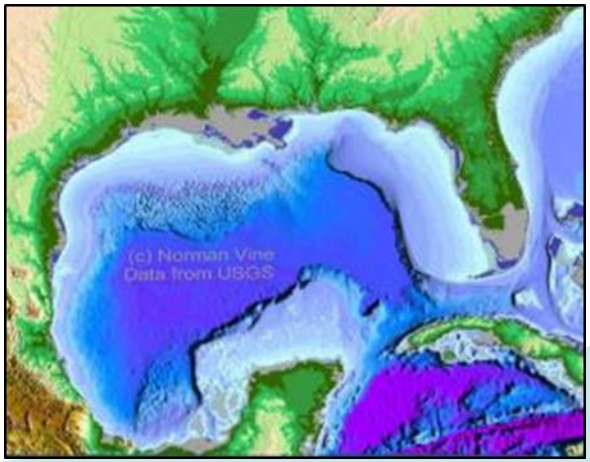
NOAA FISHERIES
Southeast Fisheries Science Center

Marine Mammal Stock Assessments

Stocks with Insufficient Data: Gulf of Mexico Oceanic Species

SEFSC Protected Species Program Review


Stenella attenuata, GOMx: SEFSC MMPA Permit



25-27 August 2015
Miami, Florida

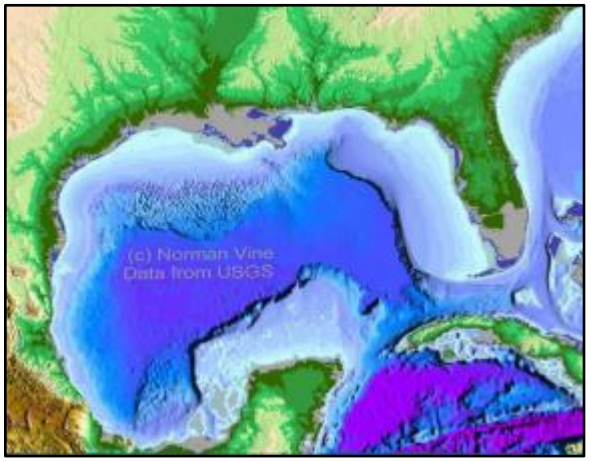
Outline

- Stocks
- Transboundary stocks
- Stock structure
- Survey schedule
- Seasonal surveys
- Precision of estimates
- Negatively biased estimates
- Most at GPRA Tier 1
- All risks not quantified
- Accomplishments
- Potential solutions

Gulf of Mexico Oceanic Cetaceans

20 species routinely inhabit oceanic waters; currently – 20 stocks

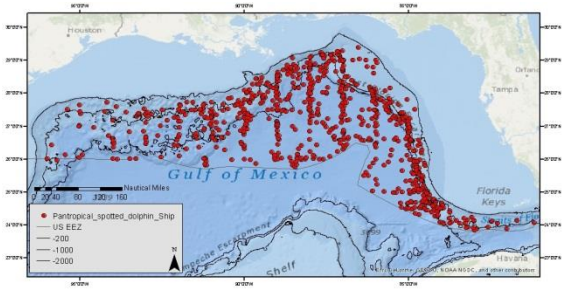
- Bryde's whale (Status review)
- Sperm whale (ESA-listed)
- Dwarf sperm whale
- Pygmy sperm whale
- Cuvier's beaked whale
- Blainville's beaked whale
- Gervais' beaked whale
- Short-finned pilot whale
- Killer whale
- Pygmy killer whale
- Melon-headed whale
- False killer whale
- Risso's dolphin
- Bottlenose dolphin
- Rough-toothed dolphin
- Fraser's dolphin
- Pantropical spotted dolphin
- Striped dolphin
- Clymene dolphin
- Spinner dolphin




Bryde's whale, GOMx: SEFSC MMPA Permit


Sperm whale: SEFSC MMPA Permit

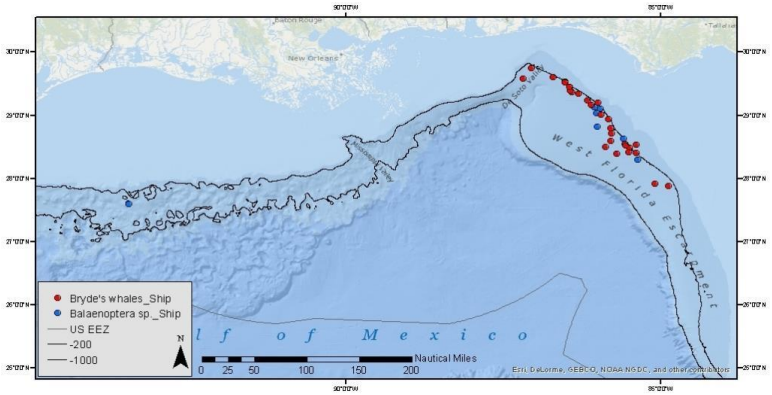

Clymene dolphin: SEFSC MMPA Permit



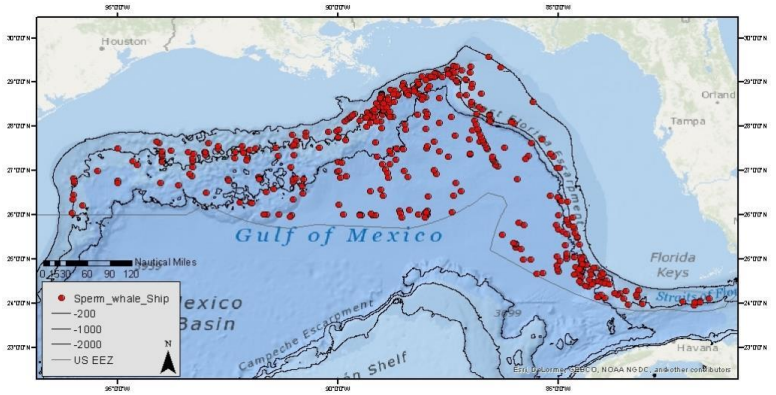

Short-finned pilot whales, GOMx: SEFSC MMPA Permit

Examples of Oceanic GOMx Abundance & Distribution Results

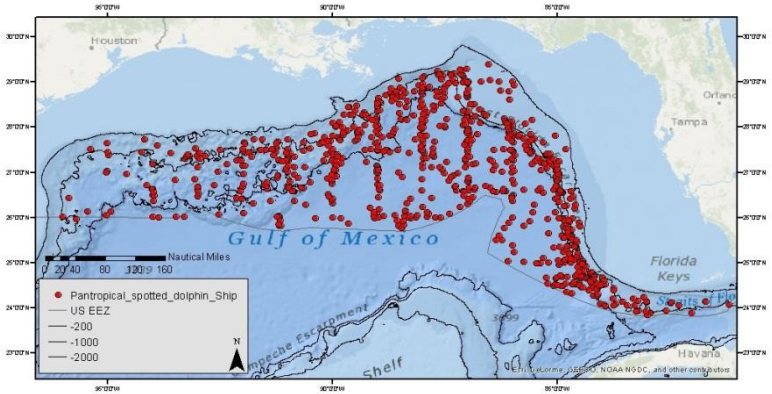
Group sightings from 1992-2009; abundances from Waring et al. (2012)



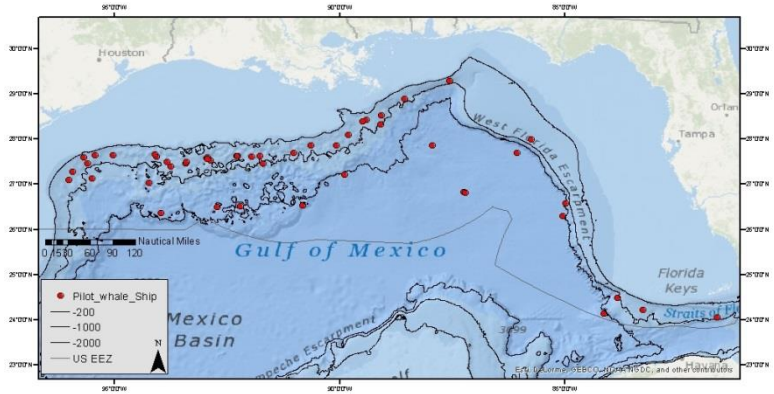
Bryde's whale: *N* = 33 (1.07)



Sperm whale: *N* = 763 (0.38)



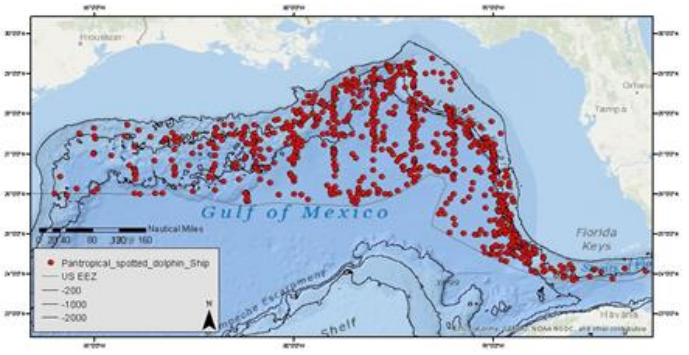
Pantropical spotted dolphin : *N* = 50,880 (0.27)

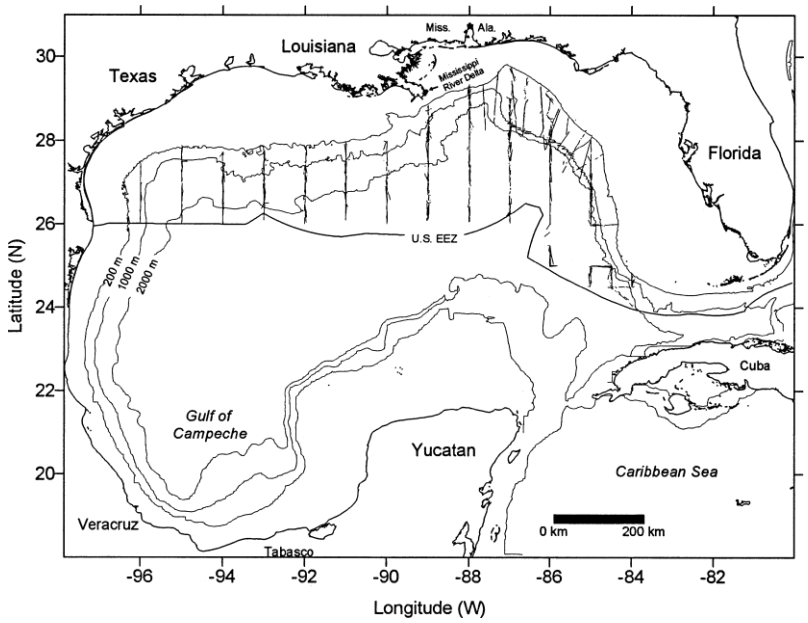


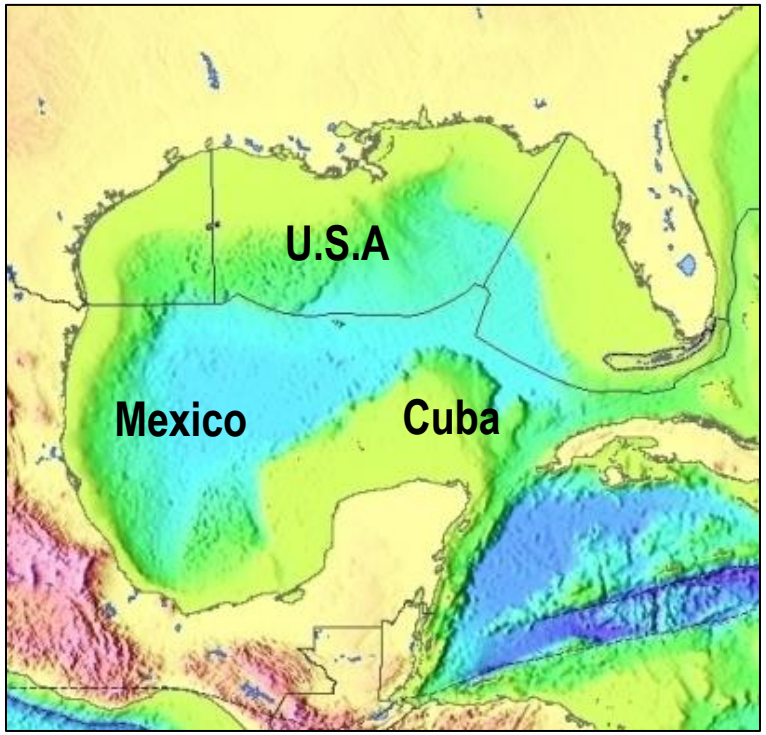
Short-finned pilot whale: *N* = 2415 (0.66)

Transboundary Stocks

- GOMx small relative to cetaceans' ability to travel
- 65% of GOMx oceanic waters: Mexico & Cuba
- Southern Gulf not assessed by any country
- Temporal abundances & distributions difficult to interpret without GOMx-wide perspective



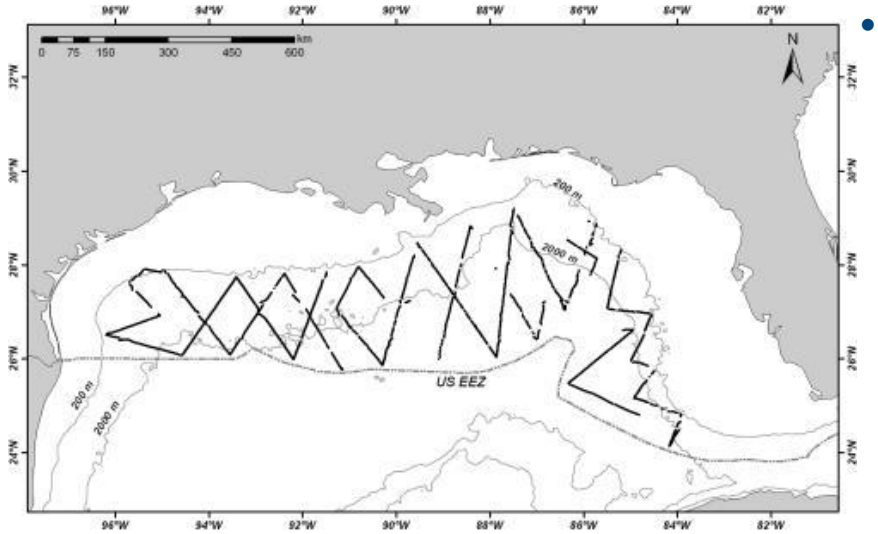




Ship-based Abundance Surveys

oceanic waters

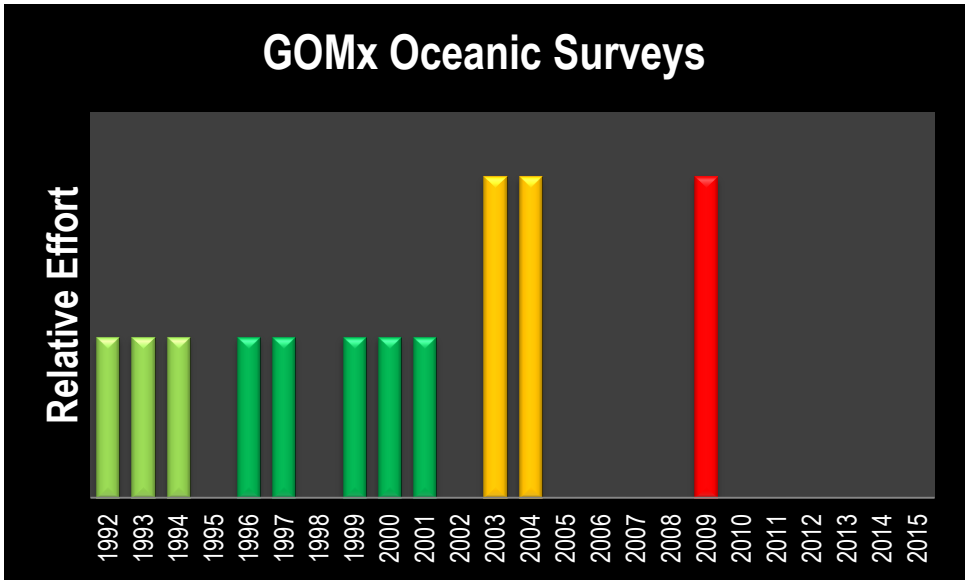
- Line-transect data
- Biopsy samples
- Oceanographic data
- Acoustic data



GOMx Oceanic Cetacean Abundance Surveys

	Estimates	Years	Season	Type	Partners
	Hansen et al. 1995	1992-1994	Spring	“piggyback”	SEFSC/BOEM
	Mullin & Fulling 2004	1996-2001	Spring	“piggyback”	SEFSC/BOEM
	Mullin 2007	2003-2004	Spring/Summer	Dedicated	SEFSC/US Navy
	Waring et al. 2012	2009	Summer	Dedicated	BOEM

- “Piggyback” – conducted during spring bluefin tuna plankton surveys
- ≈ 2X survey effort during dedicated surveys vs piggyback for same time period
- Most surveys accomplished via partnering with other federal agencies



Line-transect Surveys

Abundance estimates negatively biased for oceanic GOMx species

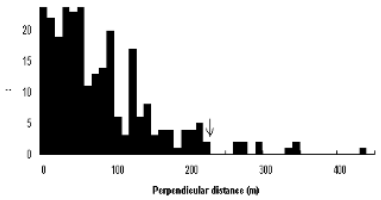
g(0) = probability of detecting an animal group/animal directly on the transect line

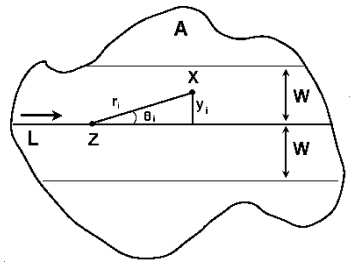
g(0) = 1: assumed for GOMx oceanic species but not always true

Perception bias – missed by observers (varies by survey conditions)
Availability bias – below surface

e.g., Barlow et al. (2015):
g(0) ≈ 1 for large schools of delphinids
g(0) < 1 (0.40 – 0.70) for large whales
g(0) << 1 (0.25 – 0.45) for *Kogia* and beaked whales

$$N_i = \sum_{j=1}^{3} \frac{A_j \cdot n_{i,\,j} \cdot S_{i,\,j} \cdot f_i(0)}{2 \cdot L_j \cdot g(0)}$$






Short-finned pilot whales, GOMx: SEFSC MMPA Permit

Gulf of Mexico Oceanic Stock Assessments

Overall adequacy of Stock Assessments (GPRA)

- Tier 1 = Inadequate
- Tier 2 = Up-to-date abundance & fisheries bycatch estimates as well as a comprehensive analysis of stock structure
- Tier 3 = Ecosystem based approach to assessments

- GOMx Oceanic
  - Tier 1
    - 19 stocks
  - Tier 2
    - 1 stock, Bryde's whale
- Estimated Precision
  - CV < 0.30
    - 1 stock, Pan. spotted dolphin
  - CV = 0.30–0.50
    - 3 stocks
  - CV > 0.50
    - 16 stocks

Striped dolphins, Atlantic: SEFSC MMPA Permit

Gulf of Mexico Oceanic Cetaceans

- Uncommon stocks will probably remain at Tier 1
  - alternative assessment methods – e.g., acoustics
- To improve precision, most stocks will require:
  - more effort per survey or
  - increased frequency of surveys
    - Solution likely back-to-back annual surveys

Number of groups sighted over 9 surveys & 45,000 km of effort ;

(≈ 6,000 km can be surveyed during one 60-day dedicated survey)

- Very common
  - pantropical spotted dolphin (381)
  - sperm whale (164)
  - Risso's dolphin (147)
- Common
  - striped dolphin (51)
  - Clymene dolphin (44)
  - spinner dolphin (40)
- Uncommon
  - false killer whale (11)
  - Fraser's dolphin (3)
  - killer whale (13)

Gervais' beaked whale, GOMx: SEFSC MMPA Permit

Gulf of Mexico Oceanic Cetacean Stocks

Stocks face multiple threats:
Pelagic longline fishery is the only one quantified

Accomplishments

Primary data that exists for GOMx oceanic cetaceans

- Duke U. habitat-based models rely on these data

Collaboration with BOEM

- e.g., GulfCet I & II BOEM reports

Routine publication/reporting of results from surveys

Collaborations with academic partners & publications

Pantropical spotted dolphins: SEFSC MMPA Permit

Improved GOMx Oceanic Assessments:

Estimates of *g*(0)

- **Estimate & correct for perception bias** – two-team approach
- **Estimate & correct for availability bias** – GOMx tagging studies, values from Atlantic or literature

Dedicated biopsy sampling – stock structure of selected species (intra-GOMx & inter-Atlantic)

Collaborative surveys with Mexico & Cuba – GOMx-wide abundance & distribution

Enhanced acoustic applications – seasonality, cryptic species (*Kogia*, beaked whales)

Back-to-back annual dedicated surveys – for more common species, surveys every 5-8 yrs would allow for estimating trends in abundance over time & more precise estimates

Risk assessment – better quantification of all risks